# College and University Compliance With a Required Meningococcal Vaccination Law

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**Abstract**. **Objective**: Maryland became the first state to pass a vaccination law requiring college and university students living on campus to obtain a meningococcal vaccination or to sign a waiver refusing vaccination because college students are at increased risk for disease. The authors sought to identify how Maryland colleges addressed the law and determine whether schools were in full compliance. **Participants**: The authors surveyed 32 college/university administrators via a self-administered questionnaire. **Methods**: The authors calculated vaccination and waiver rates and assessed compliance with the law overall and with specific law components. **Results**: Among 28 participating schools, annual vaccination rates and waiver rates among students during 2000–2004 ranged from 66%–76% and 12%–17%, respectively. Two (7%) schools were compliant with all components of the law. **Conclusions**: Mandatory vaccination laws do not ensure compliance at the college and university level. Mandatory reporting, increased education, and collaboration between colleges and universities and public health agencies are needed.

**Keywords**: college health, meningococcal disease, students, university, vaccination

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Infection with *Neisseria meningitides* (*N. meningitides*), the organism responsible for meningococcal disease, can lead to life-threatening illnesses (eg, bacteremia and meningitis). The incidence of meningococcal disease is highest among children aged < 2 years but peaks again during the adolescent and young adult years.[1,2] Approximately 75% of meningococcal disease among people aged > 11 years is caused by the C, Y, and W-135 serogroups, all of which are potentially vaccine-preventable.[3] In 2003, the US rate of meningococcal disease among people aged 18–22 years was 1.0 cases/100,000 population.[4] Among Maryland college students, the incidence and risk for *N. meningitidis* infection have been determined to be higher among those living on campus than among those residing off campus.[5] Results from subsequent studies have further affirmed that college students living on campus are at higher risk for developing meningococcal disease.[6–8] Given the increased incidence of meningococcal disease among college students, by 2001, the American College Health Association (ACHA), the American Academy of Pediatrics (AAP), and the Advisory Committee on Immunization Practices (ACIP) recommended that college students and their parents receive information regarding the risks for meningococcal disease and the availability of the vaccine.[8–10]

Subsequent to a highly publicized case of meningococcal disease in a Maryland college student who lived in on-campus housing in May 2000, Maryland became the first state to enact a law requiring meningococcal vaccination and education for all college students living in on-campus housing.[11] This requirement went into effect in the summer of 2000, and all universities and colleges were required to comply by the fall of that year. The law consists of 6 components (see Table 1).[11] Colleges and universities were not required to provide or pay for meningococcal vaccination for their students. There was no formal guidance from the Maryland Department of Health and Mental Hygiene

**TABLE 1. Requirements of the Maryland Meningococcal Vaccination Law for Students Attending Institutions of Higher Education With On-Campus Housing**

| Responsible party | Requirement |
|---|---|
| Student | 1. Shall obtain vaccine.<br>2. Submit written documentation from a healthcare provider of receipt of vaccine. |
| College/university | 3. Inform students or parents of the requirement at the time of acceptance or when registering for classes if the institution does not require an application for admission.<br>4. Provide information regarding the risks associated with meningococcal disease and the availability and effectiveness of vaccine.<br>5. Include notice of the requirement in all of the following documents:<br>• admission acceptance form,<br>• student health-related information and materials,<br>• resident life information and materials,<br>• student handbook, and<br>• college catalog. |

*Note.* Exemptions include a signed written waiver stating the student received and reviewed notice of requirement and that the student or parent (if student is aged < 18 years) has chosen not to obtain the vaccine.

(DHMH) or from the Maryland Higher Education Commission (MHEC) as to how schools should enact the law. In addition, no standard method for implementing and monitoring compliance with this law was included in the statute; therefore, each institution could design and implement its own policy.

Since the Maryland law was enacted, more than 25 additional states have enacted varying types of legislation on the use of meningococcal vaccine among college students.[12,13] Moreover, in 2005, a new conjugate vaccine against *N. meninigitidis* was licensed. This new vaccine, which protects against the same subtypes but has a longer duration of protection and greater carriage rates, is indicated for people aged 11–55 years. In June 2005, the ACIP issued a universal recommendation for use of the new meningococcal conjugate vaccine among college students.[3] Therefore, the impact of state legislation on meningococcal immunization rates among college students is an important public health concern.

To our knowledge, there has been neither a formal evaluation of the success of this law nor a review of the vaccination programs implemented by Maryland colleges and universities or by other states that have implemented similar laws and requirements for college students. Our objective in this evaluation was to identify how Maryland colleges and universities implemented the law between 2000 and 2004, and to determine whether schools are in compliance with its components.

## METHODS

### Participants

We contacted all 62 Maryland colleges and universities listed on the Maryland Higher Education Commission (MHEC) Web site[14] to determine whether they provided on-campus housing for students. We defined on-campus housing as housing operated or owned by a college or university, and we did not require that the housing be physically located on the campus of the institution.[11] We determined that 32 of the 62 colleges and universities had on-campus housing, and we subsequently surveyed them. We excluded institutions that reported no on-campus housing, nondegree-granting institutions, and 1 federal military academy because the Maryland law does not pertain to these institutions.

### Institutional Characteristics

We used Thomson Peterson's Web site[15] for 2- and 4-year colleges and universities, in conjunction with information from MHEC, to obtain information about the schools. We obtained information including program length, type of school (ie, public or private), number of undergraduate and freshmen students, total enrollment, and percentage of students residing in on-campus housing for the 2003–2004 academic year. We obtained additional information regarding the presence of a student health clinic, religious affiliation, and ACHA membership directly from the colleges through the survey or by telephone for nonresponding schools.

### Survey

We developed a self-administered questionnaire consisting of 8 sections and 61 questions. The National Center for Health Statistics, Questionnaire Design Research Laboratory of the Centers for Disease Control and Prevention reviewed the survey instrument for clarity and validity. We also pretested the questionnaire on administrators from 3 schools that did not participate in the final evaluation. These schools included a military academy and a nondegree-granting institution with meningococcal vaccination

programs, both located in Maryland, plus 1 out-of-state university. We modified the survey according to their responses and suggestions.

We contacted each eligible school and asked them to identify the person most responsible for the school's meningococcal vaccination program. In September 2004, we mailed surveys, along with a cover letter summarizing the study and a self-addressed stamped envelope, to these preidentified people. We asked participants to complete the survey within 2 weeks. One week after the first mailing, we sent an e-mail reminder that included a copy of the survey. We used telephone reminders 2 and 3 weeks after the initial mailing, to contact participants who had not yet responded. We then mailed a second survey to anyone who reported not receiving the initial mailing. Follow-up of nonresponders ended in March 2005. This was a public health evaluation of the implementation of specific Maryland laws and was conducted under existing statutory and regulatory authority of the Maryland Department of Health and Mental Hygiene and was therefore not considered research, as defined by 45CFR46.102(d).

### Analysis

Using Epi Info 2002 Version 3,[16] we performed univariate analyses to describe school-specific characteristics and policies and vaccination rates. We used chi-square tests and analysis of variance (ANOVA) to assess statistical significance of differences at a $p < .05$ significance level. We calculated vaccination coverage and waiver rates from data provided by school administrators from either a review of records or estimates. We dichotomized selected continuous variables for analysis on the basis of the median value, including the percentage of students living on campus (≤ 50% vs > 50%), the number of undergraduate students (≤ 1,700 vs > 1,700) and the number of enrolled students (≤ 2,500 vs > 2,500).

## RESULTS

Of the 32 colleges in Maryland with on-campus housing, 28 (response rate: 88%) institutions completed the survey. Table 2 presents the characteristics of the responding and nonresponding schools. Of the 28 responding schools, 16 (57%) were private institutions, and 6 (21%) had religious affiliations. Twenty-six (93%) were 4-year schools. Seventeen colleges (61%) were members of ACHA. Twenty (71%) schools had student health clinics located on campus, and 17 (61%) reported that vaccine was available on campus. For 11 (39%) institutions, the student health center was primarily responsible for the enforcement of the meningococcal vaccination requirement.

Nine (32%) of the schools reported having had a case of meningococcal disease on campus in the past 10 years**.** A review of DHMH surveillance records from 1994–2004 indicated that 7 (25%) of the schools surveyed had a case of confirmed meningococcal meningitis; 1 school had a case of viral meningitis; and at 1 school, a visiting high school student had confirmed meningococcal disease but there were no reported cases among the school's students. There

**TABLE 2. Characteristics of Institutions Responding and Nonresponding to Meningococcal Vaccination Survey**

| | Responding schools ($N$ = 28) | | | Nonresponding schools ($n$ = 4) | | |
|---|---|---|---|---|---|---|
| Characteristic | *n* | % | Median | *n* | % | Median |
| Private | 16 | 57 | | 3 | 75 | |
| Public | 12 | 43 | | 1 | 2 | |
| Program length (y) | | | | | | |
| 2 | 2 | 7 | | 1 | 25 | |
| 4 | 26 | 93 | | 3 | 75 | |
| Religious affiliation | 6 | 21 | | 0 | 0 | |
| American College Health Association member | 17 | 61 | | 2 | 50 | |
| Department responsible for enforcement of vaccination | | | | | | |
| Student health | 11 | 39 | | N/A | | |
| Housing/residential life | 7 | 25 | | N/A | | |
| Administrative department | 6 | 21 | | N/A | | |
| Joint responsibility | 4 | 14 | | N/A | | |
| Student health clinic located on campus | 20 | 71 | | N/A | | |
| Meningococcal vaccine available on campus | 17 | 61 | | N/A | | |
| Enrollment for 2003–2004 academic year | | | | | | |
| Total enrollment | 131, 990 | | 2,510 | 25,280 | | 3,193 |
| Undergraduate | 99,273 | 75 | 1,643 | 10,704 | 42 | 2,460 |
| Freshmen | 27,031 | 25 | 425 | 3,335 | 13 | 990 |
| Students living on campus (mean) | | 45 | | | 24 | |

*Note.* N/A = data not available.

were no responding schools with on-campus housing that did not report a case during this time period.

Among the respondents, for the academic year 2003–2004, total student enrollment ranged from 557 to 32,329 students ($N$ = 131,990; median: 2,510 students). Undergraduates ($n$ = 99,273; median: 1,643) constituted 75% of the total enrollment of respondent schools, and freshmen ($n$ = 27,031) comprised 21% of total enrollment at the respondent schools.

Of the 28 institutions, 12 (43%) required selected groups of students to live in on-campus housing. Among those, 3 institutions (25%) required only freshmen to live on campus; 3 (25%) also required sophomores; and 3 (25%) required all undergraduate students to live on campus. Three (25%) schools required students to live on campus on the basis of age (≤ 21 years) and distance from their permanent residence to the campus. On average, for all responding schools, 45% of students lived in on-campus housing.

Four schools (13%) did not complete the survey. Of these nonresponding schools, 3 (75%) were private institutions and 1 (25%) was public. None had religious affiliations, 2 (50%) were members of ACHA, and 3 (75%) were 4-year schools. Total enrollment ranged from 27 to 5,757 students ($N$ = 25,280; median 3,193 students). Undergraduates ($n$ = 10,704) constituted 42% of the total enrollment and freshmen ($n$ = 3,335) comprised 13% of total enrollment at nonresponding schools. On average, 24% of students at these nonresponding schools lived in on-campus housing. On the basis of a review of DHMH surveillance data from 1994—2004, none of the nonresponding schools had a confirmed case of meningococcal disease among its students.

## Adherence to the Law

Six components are included in the Maryland law (see Table 1). We assessed compliance with each component of the law, as well as overall compliance.

### 1. Student Vaccination With Meningococcal Vaccine

Although the law does not require schools to monitor or report the number of students who obtain meningococcal vaccination, schools provided vaccination coverage data for students living in on-campus housing for the academic years 2000–2004 (see Figure 1). Throughout the 4 academic years, 25%–33% of schools estimated coverage and 50%–63% provided coverage data using paper records or computerized databases. Eleven percent to 17% of schools reported using a combination of these methods to provide vaccination and waiver coverage data.

In the academic years 2000–2001, 2001–2002, 2002–2003 and 2003–2004, the mean number of students vaccinated among schools able to provide data was 66%, 73%, 72%, and 76%, respectively. For the academic years 2000–2001, 2001–2002, 2002–2003 and 2003–2004,

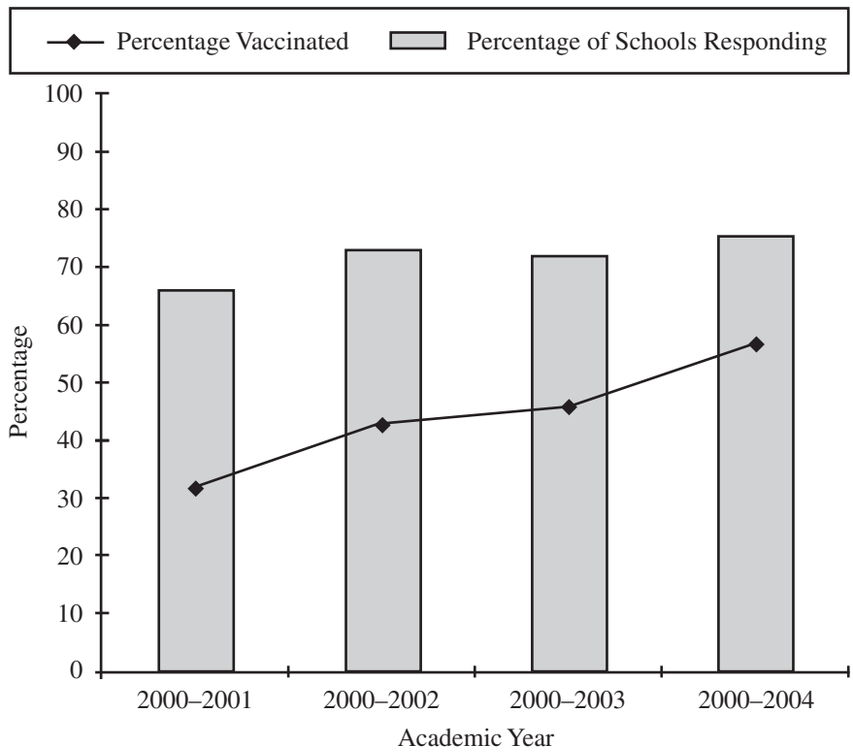


**FIGURE 1. Percentage of vaccinated students living on campus, by academic year ($N$ = 28 schools). $P$ value for trend for percentage vaccinated, $p < .001$**

among schools able to provide data, the mean number of students signing a waiver was 17%, 14%, 12%, and 13%, respectively (see Figure 2). Overall, vaccination coverage increased and waiver rates decreased during the 4 years (chi-square for trend, $p < .001$ for both). In addition, the number of schools able to provide vaccination coverage and waiver information also increased throughout the 4-year period, from 9 to 16 schools. Nine (32%) schools were able to provide complete vaccination and waiver coverage data for all 4 academic years. The results did not differ substantially when we restricted the analysis to the 9 schools that provided data for all 4 years (data not shown).

### 2. Documentation of Meningococcal Vaccination

Schools were asked how students were required to document receipt of the meningococcal vaccine. Twenty-three schools (82%) reported practices in compliance with the law that requires documentation be provided from a health-care provider. Two (7%) schools reported accepting documentation from a student, parent, or health-care provider. Three (11%) schools allowed a student or parent to complete the health form provided by the institution. No schools reported accepting verbal verification. No statistically significant differences existed between the methods of documentation and institutional characteristics.

### 3. Informing Students or Parents of the Requirement

According to the Maryland law, institutions with on-campus housing are required to notify parents or students of the requirement for meningococcal vaccination among students living on campus, either at the time of acceptance or when registering for classes. Eight (29%) schools reported notifying all students planning to live on campus of the requirement before the start of the school year. Seven (25%) schools notified all students, regardless of housing status. Six (21%) schools notified only entering freshmen, and 1 school notified only those freshmen who were going to live on campus. Three (11%) schools notified all undergraduate students, and 3 (11%) notified only those undergraduates who were going to live on campus. Institutional characteristics of schools that informed students in accordance with the law were not statistically significantly different from those that did not.

### 4. Information Provided Concerning Risks for Meningococcal Disease and Vaccine Availability

All schools provided educational materials to students and their parents. Types of information distributed regarding meningococcal disease and vaccination included institution specific information sheets ($n$ = 15 schools; 54%); informational letters from the institution ($n$ = 13 schools; 46%); DHMH meningococcal fact sheet ($n$ = 7 schools;

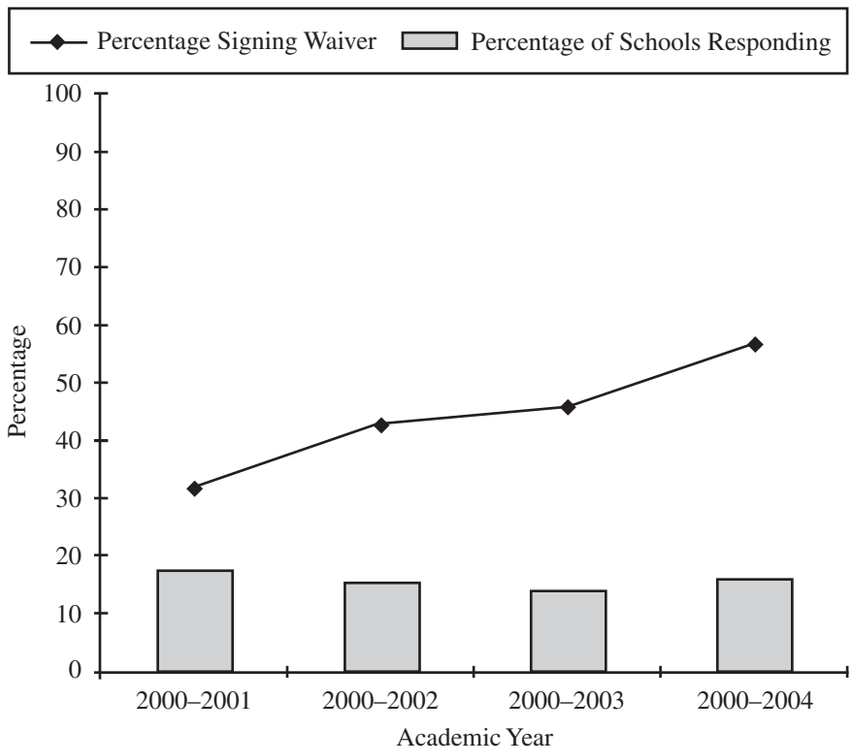


**FIGURE 2. Percentage of students living on campus who signed a waiver, by academic year (*N* = 28 schools). *P* value for trend for percentage signing waiver, *p* < .001**

25%); pharmaceutical company and/or third party vaccinator information sheets ($n = 3$ schools; 11%); and the Centers for Disease Control and Prevention meningococcal vaccine information sheet ($n = 2$ schools; 7%). Two (7%) schools also used materials from ACHA and the National Meningitis Association.

### 5. Notice of Requirement Contained in 5 Designated Documents

The Maryland law requires that schools include the notification of the vaccine requirement in 5 documents. Figure 3 illustrates the percentage of schools that included information in each of the 5 required documents. All schools included the notice in at least 1 of these documents; however, only 2 (7%) schools were in full compliance with the law and included the notice in all 5 documents. ACHA member schools were significantly more likely to include notice of the requirement in student health-related materials than were nonmembers ($p < .001$).

### 6. Access to Vaccine Waivers

Schools were asked whether students were allowed to sign a waiver declining vaccination. All 28 responding schools allowed students to sign a waiver, as the law requires. Twenty (71%) schools provided meningococcal vaccine waiver forms. To sign a waiver at 22 (79%) schools, a student was required to review a meningococcal vaccination information sheet; at 4 (14%) schools, a student had to speak with staff at student health services or with a healthcare provider before signing. Six (21%) schools required nothing additional of the student. Schools with larger numbers of undergraduate students (> 1,700) were significantly more likely to provide waiver forms ($p = .04$) than were smaller schools. Schools requiring certain students to live on campus—and more specifically freshmen—were significantly more likely to require students to speak with a healthcare provider before completing a waiver form ($p = .02$ and $p = .006$ respectively).

## Overall Compliance

Table 3 shows the overall compliance with the individual components of the Maryland law. On the basis of these 6 components, 2 (7%) schools were compliant with all 6 components of the law; 10 (36%) schools were compliant with 4 components of the law; and 16 (57%) schools were compliant with 5 components of the law. All schools were compliant with at least 4 of the requirements of the law including the requirement to ensure that students are vaccinated or had signed a waiver. The 2 schools that were fully compliant were able to include information about the meningococcal requirement in all 5 designated documents. Schools that met 5 components of the law were significantly more likely to have vaccines available on campus ($p = .03$). Otherwise, no other statistically significant differences existed among the schools with regard to level of compliance.

## COMMENT

The Maryland law was in effect for 4 years prior to this evaluation. From 2000–2004, Maryland surveillance data

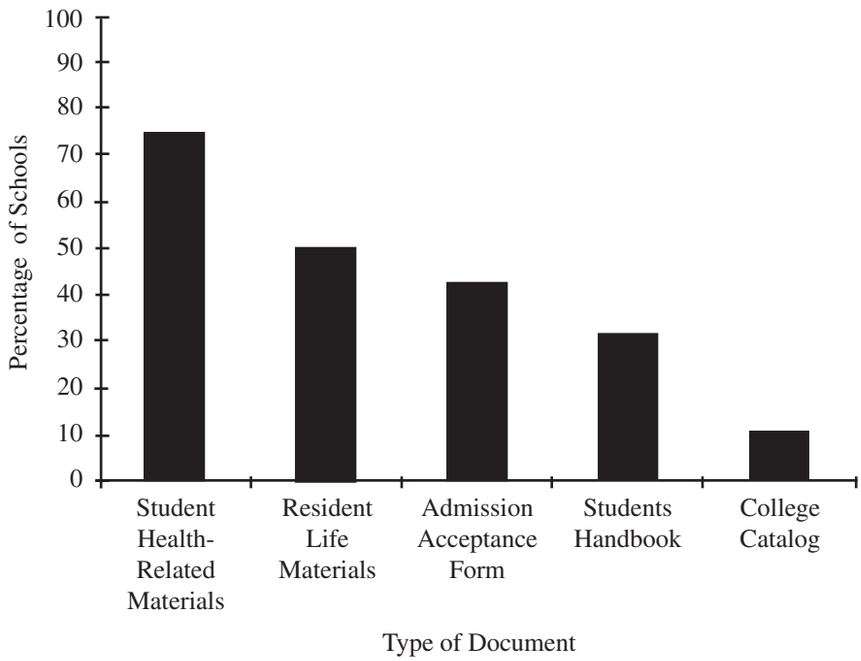


**FIGURE 3. Documents containing notice of the requirement for meningococcal vaccination as required by Maryland law.**

**TABLE 3. School Compliance With Maryland Law, by Specific Component of Law**

| Component of law | Schools complying | |
|---|---|---|
| | *n* | % |
| Provided vaccine on campus or referred students elsewhere | 28 | 100 |
| Required documentation of vaccination from a health care provider | 23 | 82 |
| Informed student or parent of vaccine requirement | 23 | 82 |
| Provided information regarding disease and vaccine to student or parent | 28 | 100 |
| Included notice of vaccine requirement in all 5 documents | 2 | 7 |
| Allowed waivers | 28 | 100 |

showed 7 confirmed cases of meningococcal disease among college students. During this same period, meningococcal vaccination coverage increased with a corresponding decrease in the number of waivers signed. An ACHA national survey of college and university practices in 2004 reported median meningococcal vaccination rates of 20% and 35% for the academic years 2002–2003 and 2003–2004, respectively.[17] Therefore, in comparison, meningococcal vaccination coverage at Maryland colleges and universities is relatively high, at 72% and 76%, respectively, for those 2 years.

Despite the fact that meningococcal vaccine has only recently become a recommended vaccine among college students, vaccination coverage among Maryland college students appears higher than those of other recently licensed and recommended vaccines (eg hepatitis B and varicella). During 2000–2004, ACHA surveys estimated national coverage of hepatitis B and varicella among college students to be 55.9%–68.6% and 47.7%–52.6%, respectively.[17] Therefore, meningococcal vaccination may be more acceptable to students and their parents than are other vaccines recommended for this population.

Although coverage rates were relatively high among this population, a limited number of Maryland schools surveyed maintained easily accessible summary records on meningococcal vaccination. Only 9 schools (32%) were able to provide complete coverage and waiver data for 2000–2004, which not only makes coverage information difficult to use as an indicator of a successful program, but also makes identification of students at risk for disease during an outbreak of meningococcal disease more difficult.

Only 2 schools were compliant with all 6 components of the law. Informing parents and students of the requirement before arrival on campus by placing information in such materials as the acceptance letter is an area in which most schools were not compliant. This might have resulted in reduced vaccination rates. Receipt of vaccine information before a student's arrival on campus has been associated with overall higher vaccination rates and also leads to greater prearrival vaccination rates and fewer on-campus vaccinations; therefore, inclusion of the notification in these materials is warranted.[18]

From our results, we could not easily identify indicators of compliant meningococcal vaccination programs. In our survey, no school characteristics consistently predicted the success of a school's program. Even when comparing the more compliant schools, no factors or characteristics substantially differentiated levels of compliance with the law.

The results of our evaluation also illustrate that, as the law stands, waivers against vaccination are relatively easily obtained. We determined that as many as 17% of students signed waivers per academic year compared with school-age populations, in which < 1% of new school entrants requested waivers.[19] Researchers[20,21] have identified an inverse relationship between the complexity of obtaining a vaccine exemption and the percentage of students who claimed exemptions. At the college level, certain administrative procedures may make obtaining waivers for students easier and thus may explain the lower coverage rates for meningococcal vaccination than those of other vaccines that are required for school entry.

The easy availability of waivers at schools may also reduce vaccination rates if students or their parents choose waivers simply because they are easier to obtain than vaccinations. Rota et al[20] found that restricting waiver forms to limited locations (eg, health clinics or local health departments) allows for better opportunities for further education about the risks and benefits of vaccination. Therefore, limiting the availability of waivers may not only lower the number of waivers signed but also may provide an additional opportunity for enhanced education.

Despite a high response rate, a limitation to our evaluation included the relatively limited number of schools surveyed, which potentially decreased the power to detect meaningful associations between school characteristics and vaccination. Vaccination coverage rates might also have varied because as many as 33% of schools during some academic years were able to provide only estimates and not precise numbers of students vaccinated. Furthermore, we were not able to verify each school's vaccination

coverage numbers. In addition, nonresponding schools differed from the responding schools with regard to key characteristics (eg, enrollment and percentage of students living on campus).

## Conclusions

To improve compliance, legislators may consider modifying existing statutes and regulations to include reporting guidelines (eg, those used for elementary and secondary schools), which may allow for better monitoring of vaccination and waiver coverage among college populations. To assist in maintaining vaccination records, state and local health departments might be able to assist colleges and universities by providing them with model databases for tracking student vaccinations (eg, immunization registries) used for other vaccine-preventable diseases.

Collaboration between state and local public health agencies and colleges and universities is essential to ensure the success of mandatory vaccination laws. Public health departments can assist in reinforcing the various components of the law and possibly assist in providing access to vaccines. Education by public health professionals of not only health-care providers but also residential life and school administrators responsible for meningococcal vaccination programs may be beneficial because nonhealth-care providers may relay misinformation regarding vaccine-preventable diseases.[22] Joint development and dissemination of standard materials about meningococcal disease and vaccination requirements will also help ensure that consistent and correct information regarding the disease and the importance of vaccination are available.

The decision to obtain vaccination ultimately falls in the hands of parents and young adults. For this evaluation, we did not survey primary-care providers, students, or their parents; therefore, evaluating barriers to vaccination among these groups is an area needing to be addressed. In their study in New York City, Sun et al[23] found that accessibility to a vaccine was correlated with ethnicity, primary language, insurance status, and income, and perhaps these concerns need to be explored in Maryland. College administrators should query students and their families to determine their knowledge, attitudes, and beliefs about meningococcal disease and reasons for obtaining or declining vaccination.

Given the possibility of an association between receipt of the conjugate vaccine and Guillain-Barré Syndrome, lower rates of vaccination in all age groups may be expected. However, the combination of the licensing of the conjugate vaccine, revisions of the ACIP recommendations to vaccinate all college freshmen living on campus, and the fact that more than 25 states have followed Maryland's lead by requiring vaccination among college students living in dormitories, may still lead to an increase in meningococcal vaccination coverage among college students. With this increase, the need will continue for the evaluation of mandatory vaccination laws to determine the extent of compliance and the ultimate impact on the public's health.

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Dr Castel conducted this work while an epidemic intelligence service officer with the Centers for Disease Control and Prevention, assigned to the Office of Epidemiology and Disease Control Programs, Maryland Department of Health and Mental Hygiene, Baltimore, MD.

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# WHEELER HOUSE

The University of Vermont

This Federal period, 2-story brick dwelling was built in 1842 for the Reverend John Wheeler (1796–1862), the sixth president of the University of Vermont (UVM) from 1833–1848. Wheeler House, as it became known, enjoyed a close relationship with the university even though it remained a private residence for several generations of the Wheeler family until 1943. At various times, the residence served as a boarding house for female students, a stop on the Underground Railroad during the Civil War, and a meeting place for the UVM Chapter of Phi Beta Kappa.

Prior to 1945, UVM had modest facilities for student health; the first infirmary on campus was opened in 1921 and was exclusively for women. Later, a small clinic with limited facilities opened in the Waterman building. Wanting a modern health facility for UVM students, a group of alumni and friends raised $30,000 to purchase Wheeler House in 1944. Extensive alterations were made to the building, and in 1946 a health center and the 36-bed Wasson Memorial Infirmary opened. The "Infirmary," as it became known on campus, was named after Pearl Randall Wasson, the first dean of women at UVM.

As enrollment at UVM increased over the next 2 decades, the Wheeler House became cramped and inefficient but, because it was an historic building, could not be expanded. In 1975, the university health services moved to a larger facility on the east side of campus. Today, the 165-year-old Wheeler House is home to the UVM departments of history and historic preservation and is listed in the National Register of Historic Places. This undated photograph of Wheeler House was probably taken in the mid-twentieth century. I found it framed and displayed near the reception desk in Wheeler House.

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Director of the UVM Student Health Center, 1981–1993

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The executive editors of the *Journal of American College Health* welcome submissions of historical photographs of university health centers. If you would like to submit a photo, please contact the managing editor at jach@heldref.org for further details.